



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/927,003	08/08/2001	Byoung-Youp Kim	TJK/190/L.W.	4165
26689	7590	10/23/2003	EXAMINER	
WILDMAN, HARROLD, ALLEN & DIXON 225 WEST WACKER DRIVE CHICAGO, IL 60606			MEEKS, TIMOTHY HOWARD	
			ART UNIT	PAPER NUMBER
			1762	

DATE MAILED: 10/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/927,003	KIM ET AL.	
	Examiner	Art Unit	
	Timothy H. Meeks	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 14-18 is/are rejected.
- 7) ☒ Claim(s) 8-13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Application Status

The amendment filed on 21 August 2003 in response to the Office Action mailed on 17 April 2003 has been fully considered. In the amendment, applicants have amended claim 5 to correct an informality. Claims 1-18 are pending.

Claim Objections

Claims 1 and 6 are objected to because of the following informalities: In claim 1, line 3, "vaport" should be "vapor". In claim 6, line 2, some words have been omitted between "sccm.a" and "chemical". Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tobe et al. (6,080,446).

Tobe discloses a process for depositing TiN comprising evaporating TDEAT at a rate of 0.004 to 0.2 g/min and introducing it in a chamber holding a substrate, providing ammonia in the chamber at a flow rate of 10-100 sccm, providing a pressure of about 0.1 to 15 Pa, and providing a substrate temperature around 300 °C (col. 4, lines 15-25, and 31-32, col. 7, lines 55-56). Given the TDEAT evaporation rate range and ammonia flow rate range, the range of ratios of TDEAT evaporation rate to ammonia flow rate covered thereby overlaps with the claimed range. It

Art Unit: 1762

would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness, see *In re Malagari*, 182 USPQ 549. It is noted that the pressure of Tobe is below the lower limit of claim 1. However, it has been established that "Where the principal difference between the claimed process and that taught by the reference is a temperature difference, it is incumbent upon applicant to establish criticality of that difference", See *Ex parte Khusid*, 174 USPQ 59. This decision is clearly analogous to pressure differences and other process parameters. If applicant can establish a showing of criticality in the claimed pressure, the rejection will be withdrawn.

With respect to claim 4, see col. 4, lines 14-30. With respect to claim 5, Tobe discloses nitrogen carrier gas rather than helium or argon but does not appear to limit the carrier gas and substitution of one inert carrier gas for another would have been obvious with the reasonable expectation of achieving similar results. With respect to claim 6, see col. 4, line 21. With respect to claim 7, see col. 6, lines 54-64.

Claims 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tobe et al. in view of Jimba et al. (5,672,385).

Tobe does not explicitly disclose deposition in a chamber with walls having a heat exchanger for temperature control to the claimed temperatures. However, because Jimba discloses that such apparatus used to maintain a wall temperature of about 70 °C is effective for depositing TiN using the precursors and conditions disclosed by Tobe (col. 3, lines 35-50), it

Art Unit: 1762

would have been obvious to have used such apparatus with a reasonable expectation of its being operable for depositing the TiN films.

Claims 1-7 and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tobe et al. in view of Jimba et al. and Konecni et al. (6,069,072).

Tobe and Jimba are applied as in the manner above. The pressure of Tobe and Jimba is below the lower limit of claim 1.

As shown in Figure 2 and described at col. 5, lines 52-68, the pressure range 0.1 to 15 Pa is deemed desirable for achieving high bottom coverage when coating holes with TiN. However, figure 2 also shows that deposition rate continues to increase at pressures above 15 Pa even though bottom coverage decreases. Based upon these teachings, it would have been obvious to have used higher pressures than 15 Pa in processes wherein it desired to deposit TiN on a flat surface wherein bottom coverage in a hole is not a factor, such as deposition of CVD TiN layer 360 shown in figure 3 of Konecni, so as to increase the deposition rate of the TiN layer and thus reduce overall process time.

Allowable Subject Matter

Claims 8-13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art does not teach or reasonably suggest use of the process conditions specified in claims 8 and 9 or the reactor specified in claims 10-13 for depositing the TiN under the claimed conditions.

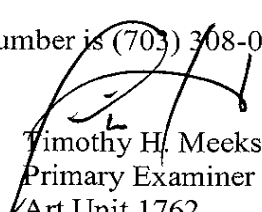
Response to Arguments

Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy H. Meeks whose telephone number is (703) 308-3816. The examiner can normally be reached on Mon., Tues., Thurs.(6-6:30), Fri.(6:30-10:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P. Beck can be reached on (703) 308-2333. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.


Timothy H. Meeks
Primary Examiner
Art Unit 1762